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Differences in the earnings distribution of self- and dependent employed German men – evidence from a quantile regression decomposition analysis

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Abstract

This paper uses data from the German Socio-Economic Panel for the years 2000 to 2005 to study the earnings differential between self- and dependent employed German men. Constructing a counterfactual earnings distribution for the self-employed in dependent employment and using quantile regression decompositions we find that the earnings differential over the distribution cannot be explained by differences in endowments. Furthermore, low-earning self-employed could earn more in dependent employment. Finally, the observed earnings advantage for the self-employed at the top of the earnings distribution is not associated with higher returns to observable variables.

Keywords: self-employment, earnings differential, quantile regression decomposition, Machado/Mata decomposition
JEL Classification: J31, L26

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1 Introduction

It is a well-established empirical result that the factors shaping labor earnings differ between the self- and the dependent employed (see Parker 2004, pp. 20-23 for a survey). Furthermore, it is also well-known that self-employed earnings are typically more dispersed than those of the dependent employed placing the self-employed to a greater extent in the tails of the population's earnings distribution (see Parker 2004, pp. 18-20 for an overview of the available evidence). However, relatively few attention has been paid to the existence, the shape and the determinants of the earnings differential between the self- and the dependent employed.

Additionally, the available evidence is somewhat mixed. For the USA, several studies have found higher average earnings in dependent employment, while several others found evidence on higher earnings in self-employment. In contrast, evidence from the UK and several transition countries in Europe indicates an earnings advantage for the self-employed (see Parker 2004 pp. 16-18 for an overview on the available evidence).

The evidence remains mixed when controlling for observable differences between the self-and dependent employed and after taking non-random selection into the respective occupation into account. Most of the relative few papers taking that path rely on an occupational choice framework.[1] These papers typically consider selectivity-corrected (mean) earnings differentials as a determinant in a model of occupational choice. Typical results indicate that the returns to observable characteristics differ between the self- and dependent employed, while results on selection effects and the shape of the earnings differential usually vary across studies.

Besides this strand of the literature, some studies have taken a different approach: Headen (1990) calculates counterfactual mean wages for self-employed physicians in the U.S. by estimating separate selectivity-corrected earnings regressions for the self- and dependent employed and predicting wages for the self-employed using the coefficients from the dependent employed. His findings suggest that the self-employed would earn 7.4% more per hour than the dependent employed when engaging in dependent employment (in Dollars, this difference amounts to 25.78$ vs. 24$). Note however, that given his very specific sample, a generalization of his results seems difficult.

While no clear-cut result emerges from these studies, a comparison of mean earnings, as already mentioned above, may also be misleading on theoretical grounds. Given the greater heterogeneity of the self-employed earnings, any comparison of mean earnings may fail to detect large differences that occur in the tails of the respective earnings distributions.

In the first paper to be concerned with the respective wage distributions, Hamilton (2000) uses quantile regressions and different measures for the self-employed earnings to predict earnings profiles for persons at the mean, the median and the 25% and 75% deciles of the respective wage distribution. His findings suggest that the self-employed in the lower quartiles of their earnings distribution could earn substantially more when switching into dependent employment. For a self-employed person with 20 years of work experience and 10 years tenure with his current firm who currently earns the median wage, he estimates a

[1] Examples include Rees and Shah (1986), Gill (1988), Borjas and Bronars (1989), Evans and Leighton (1989), Dolton and Makepeace (1990), Bernhardt (1994) and Taylor (1996).

15 % increase in hourly earnings after the switch into dependent employment, even when taking the loss of tenure into account.

Theoretical considerations dealing with this phenomenon and addressing the fact that some persons, while being (formally) free to switch between occupations, seem to voluntarily select into and remain in the lower parts of the population's earnings distribution, are also rather few.

A possible explanation for this phenomenon is that low-achieving workers who are unable to find work in dependent employment are pushed into self-employment. While the existence of such push-factors has been quite early documented empirically (see e.g. Evans and Leighton 1989), it can only explain the existence of low-achieving entrepreneurs at the bottom of the distribution.

An idea that is similar in spirit has emerged in the entrepreneurship literature during the last years. Beginning with the Global Entrepreneurship Monitor (GEM), the literature now distinguishes between two types of entrepreneurs, one – consequently labeled as "opportunity entrepreneur" – that is driven by the perception of an "entrepreneurial opportunity", e.g. a good business idea, and another – labeled as "necessity entrepreneur" – that is forced into self-employment by pure economic need, caused e.g. by a lack of job opportunities in dependent employment.

In a recent paper, Malchow-Møller, Markusen, and Skaksen (2005) develop a model that is able to explain the existence of both high and low earning self-employed workers. In their model they assume the existence of an implicit minimum wage given by unemployment insurance and institutional wage compression in dependent employment, leading to both an upper and lower bound on the dependent employed's earnings. Low earning self-employed are formed by those persons whose productivity is too low to find work in dependent employment, but is high enough to lead to earnings in self-employment that exceed the unemployment compensation offered by social insurance. For high-productivity workers, self-employment is a way to escape the compressed wage structure and receive higher earnings than those possible in dependent employment. Their theory also provides an explanation for the rising share of self-employed among older individuals by assuming higher learning rates and a quicker rise in human capital in dependent employment.

While we do not attempt to formally test these theories, they provide a valuable starting point for our empirical analysis. More specifically, all of these theories point toward the existence of a higher share of high and low productivity individuals in self-employment compared to dependent employment. Empirically, this would suggest an earnings disadvantage for the self-employed that is caused by less favorable endowments at the bottom of the wage distribution and a corresponding earnings advantage at the top of the distribution.

This paper contributes to the literature by using for the first time a quantile regression decomposition technique developed by Machado and Mata (2005) that decomposes the raw earnings difference over the whole distribution into a part explainable by differences in endowments and into a part that is due to differences in coefficients. This decomposition enables us to answer the following two questions: (1) Can the raw earnings difference be explained by differences in endowments, e.g., do only the very able and the very unable become self-employed? (2) Could some of the self-employed earn more in dependent employment, e.g., would their endowments yield higher returns in a different occupational status?

In a first step, we model the respective income distributions of the self- and dependent employed using quantile regressions. This provides some evidence on the factors shaping the respective earnings over the whole distribution. In a second step, the aforementioned Machado/Mata-decomposition is used to determine what part of the earnings difference can be explained by differences in endowments and to what extent it is caused by differences in coefficients. Since this decomposition involves the creation of an earnings distribution for the self-employed that describes their earnings in the counterfactual situation of dependent employment, we can also make a statement whether (and for whom) self-employment is (financially) "worth it".

The rest of the paper is organized as follows. Section 2 presents the data used in this study, while section 3 presents some descriptive results. The econometric model is described in section 4. Results are shown in section 5, section 6 concludes.

2 Data

This paper uses data from the German Socio-Economic Panel[2] (SOEP), an annual household survey conducted among German-resident households since 1984.

The analysis is based on the subsamples A to F. Sample A "Residents in the FRG", surveyed since 1984, is drawn from the population of households whose head does not belong to one of the "guestworker" nationalities (Turkish, Greek, Yugoslavian, Spanish, and Italian). The latter were surveyed in sample B, labeled "Foreigners in the FRG", which oversampled households with a household head with one of the aforementioned nationalities. Households from the German Democratic Republic were included since July 1990 in Sample C "German Residents in the GDR". In 1994/1995 households whose head migrated to Germany after 1984 were surveyed in sample D "Immigrants". Samples E "Refreshment" and F "Innovation" beginning in 1998 and 2000 respectively were drawn from the population of the German households.[3] Further information on the sampling design as well as additional information on the overall structure of the SOEP can be found in Haisken-DeNew and Frick (2005).

We restrict our sample to German men between 25 and 55 years of age, to avoid problems with persons still in the educational system as well as the issues of early retirement and female labor market participation. Furthermore, we restrict the sample to those either born in Germany or having migrated before 1949 to avoid problems related to discrimination and non-random selection of migrants. Note that this does not exclude all members from the "immigrant" samples B and D since inclusion in these samples was based on the nationality of the respective household head thus e.g. German-born spouses or children of foreign household heads were also included in these samples. Furthermore, we restrict the sample to those men in full-time employment who are either dependent or self-employed, excluding any remaining apprentices or persons helping in family businesses. Due to low case numbers, we also exclude those persons reporting to work in agriculture or mining, as well as those where occupational information was missing. Finally, we exclude cases

[2]See http://www.diw.de/english/sop/service/index.html for information and documentation on the SOEP.

[3]There is also a sample G "Oversampling of High Income", surveyed since 2002, originally drawn from the population of households with a monthly income over 2,835 € (7,000 Deutsche Mark) that is not used in this analysis.

reporting monthly labor incomes below 500€ and above 10,000€ to avoid problems with outliers. Note that our sample still contains persons reporting unusually low hourly wages in the magnitude of 2€. These cases usually report sensible monthly earnings and relatively high working hours and are employed as managers in supermarkets or similar occupations. Given the relative robustness of our estimation method to the presence of outliers, these cases which seem plausible have been left in the data. Pooling data over the years 2000 (availability of subsample F) to 2005 (latest wave currently available) or waves q to v, our final sample contains 20,574 person-year-observations with 1,909 self-employed.

To account for differences in workings hours between the self- and dependent employed we construct a measure of hourly earnings using self-reported monthly gross labor earnings and self-reported actual weekly working hours as (gross monthly labor income $*$ 12)/(weekly working hours $*$ 52). Wages are deflated using a standard consumer price index from the Federal Statistical Office (*Statistisches Bundesamt*).

The data also contains information on school and post-school education, lifetime full-time work and unemployment experience, tenure with the current firm, and occupations. Regarding schooling we distinguish those with higher secondary schooling (*Abitur*) that allows access to academic education from those with less than secondary schooling, which includes school drop-outs as well as those who completed the *Hauptschule* or the *Realschule*. Post-school education is measured in the categories "no post-school training", "vocational training" and "academic education".

Information on current occupations is based on a standard classification of occupations by the Federal Statistical Office. This information has been aggregated into the broad categories "production", "technical occupations", "salesmen", "management, office workers", and "other services". Descriptive statistics for the whole sample can be found in table 1.

(Table 1 about here.)

3 Descriptive Results

Taking a quick look at the data that is used in this paper, one notices that the earnings distributions of the self- and dependent employed shown in figure 1 indeed follow the expected shape: The self-employed's distribution has more mass concentrated in the tails, while relatively more dependent employed are concentrated near the mean.

(Figure 1 about here.)

Focusing now on differences in the mean characteristics of the self- and dependent employed shown in table 2, several differences can be noted. Firstly, the gross monthly labor earnings as well as the hourly wages are on average higher for the self-employed. Monthly earnings in this group tend to be around 600€ higher than for the dependent employed. A difference also remains after taking different working hours into account with hourly wages being around 1€ higher for the self-employed.

Secondly, possible reasons for this earnings differential become apparent when looking at the characteristics of the respective individuals in the two groups. On average, the self-employed tend to be higher educated with higher shares having received higher secondary

schooling or academic training. Additionally, the self-employed have on average slightly more labor market experience with their lifetime (full-time) work experience being around half a year higher. Note, however, that this difference is rather small in absolute terms and does not seem to be able to explain the observed earnings differential. In contrast, average tenure is somewhat higher for the dependent employed.

Probably more importantly, the distribution of occupations differs between the two group with the main difference being the higher share of dependent employed working in production and technical occupations and the higher share of self-employed working in services and sales.

(Table 2 about here.)

Table 3 and figure 2 present some further evidence on the shape of the earnings differential. First, focus on monthly earnings. Here, the earnings distribution is clearly favorable for the self-employed. A large earnings penalty in the magnitude of 200 to 75€ can only be seen below the 20% decile, while a clear and rising earnings advantage can be noted from the 40% decile onward. At the top of the earnings distribution the earnings differential is clearly in favor for the self-employed whose monthly earnings are up to 1,800€ higher than those of the dependent employed.

(Table 3 and figure 2 about here.)

However, this earnings difference is clearly influenced by different working hours as can be seen from the distribution of hourly wages. Here, the self-employed hourly earnings below the 40% are between 1.5 and 2.5€ smaller then those of the dependent employed. This difference becomes rather small between the 50% and 60% decile, ranging between -.7€ and .2€ in favor of one of the two groups respectively. From here on the differential quickly widens in favor of the self-employed with an earnings advantage of 6€ at the 90% decile.

4 Econometric modeling

To learn about the factors shaping the respective earnings distributions, we estimate standard earnings functions, where we regress log hourly earnings on a number of labor market relevant characteristics, like education and work experience, separately for the self- and dependent employed by OLS and quantile regressions. We choose (log) hourly rather than monthly earnings as the dependent variable to take into account differences in working hours between the self- and dependent employed.

As regressors, we include total unemployment and total full-time employment experience, a well as tenure with the current firm to capture the individual labor market history. To account for possible non-linear effects all variables are also included in squared terms.

School and post-school education is measured by three dummy-variables for having received higher secondary schooling (*Abitur*), having received no further training after leaving school and having completed an academic degree. Base alternatives are given by

schooling below *Abitur*-level and by having completed vocational training which is the case for roughly 70 % of the sample.

To account for different occupations, five dummy variables for "production" , "technical occupations", "salesmen", "management and office clerks" , and "other services" are used where "production" is used as the base category. Note that a finer measurement of this variable is not possible for two reasons. Firstly, since the number of cases is very small for a large number of occupations, their effects could hardly be estimated from the data. Secondly, the counterfactual analysis described in detail below, creates an answer to the question "What would a given, now self-employed, person with given education and experience earn when doing his current job for the same time but in dependent employment?". While it seems reasonable to assume that persons will remain in similar occupations when switching between self- and dependent employment, the assumption that they remain in exactly the same job seems unreasonable restrictive.

Finally, since observations from the same year may be influenced by common shocks, dummy variables for the years 2001 to 2005 are also included with the year 2000 serving as the base alternative.

In a second step, the quantile decompositions technique developed by Machado and Mata (2005) is applied. Briefly summarized, the decomposition is based on the creation of a credible counterfactual wage distribution, that is subsequently compared with the marginal wage distributions of the groups under study. In our case, interest lies in modeling the wage distribution for the self-employed in the counterfactual case of dependent employment. Note that this means that we are decomposing the difference between the dependent employed's wage distribution and the self-employed's wage distribution, that is $w(dependent) - w(self)$ and not vice versa.

More detailed, the creation of the counterfactual and marginal distributions involves the following steps:

1. Draw m random numbers $u_i, i = 1, \ldots, m$ from a uniform distribution in the interval $[0, 1]$. This gives m quantiles at which the regressions are to be estimated. Following Albrecht, Björklund and Vroman (2003) and Kohn (2006), we modify this step by estimating the quantile regressions at each quantile from 1 to 99 instead of drawing the quantiles from a uniform distribution. This approach has the benefit of being less computer intensive and also avoids some convergence problems that occurred when extreme quantiles (e.g. $0.999\ldots$) were drawn while not severely changing the quantiles at which the regressions are estimated.

2. Use the data set on the dependent employed and estimate quantile regressions with the specification described above at each u_i to receive m estimates for the regression coefficients $\hat{\beta}_0(u_i)$ at quantile u_i.

3. Draw a random sample of size m with replacement from the data on the dependent employed. Using this data, denoted by $x_i(0), i = 1, \ldots, m$, and the previously estimated coefficients $\hat{\beta}_0(u_i)$ one can generate an random sample $\hat{w}_i(0) \equiv x_i(0)'\hat{\beta}_0(u_i)$ from the dependent employed's marginal wage distribution.

4. Draw a random sample of size m with replacement from the data on the self-employed. To generate a wage distribution for the self-employed in the counterfactual case

of dependent employment, use this data, denoted by $x_i(1), i = 1, \ldots, m$, and the estimated coefficients $\hat{\beta}_0(u_i)$ and calculate m counterfactual wages $\hat{w}_i{}^*$ by $\hat{w}_i{}^*(1) \equiv x_i(1)'\hat{\beta}_0(u_i)$. This procedure uses the characteristics of the self-employed and the "returns" these characteristics would yield in dependent employment to generate a sample from the wage distribution for the self-employed if they engaged in dependent employment.

5. Finally, generate a random sample of the marginal wage distribution for the self-employed ($\hat{w}_i(1)$) by repeating steps (2) and (3) using the data on the self-employed and calculating $\hat{w}_i(1) \equiv x_i(1)'\hat{\beta}_1(u_i)$.

The resulting distributions $f^*(\hat{w}(0))$, $f^*(\hat{w}(1))$, and $f^*(\hat{w}^*(1))$ can be used to decompose the differences between the observed distributions $f(w(0))$ and $f(w(1))$. Since $f^*(\hat{w}(0))$ and $f^*(\hat{w}^*(1))$ have been estimated using the same coefficients, differences between these distributions at each quantile from 1 to 99 can be attributed to differences in endowments. In a similar fashion, a comparison of $f^*(\hat{w}(1))$ and $f^*(\hat{w}^*(1))$ at the same quantiles gives the difference that is caused by differences in coefficients since both distributions have been calculated using the same endowments.

More formally, let $Q_i(\hat{w})$ denote the ith quantile of the distribution of $\hat{w}$, where $\hat{w}$ is either $\hat{w}(0), \hat{w}(1)$ or $\hat{w}^*(1)$. Then the observed raw difference $Q(w(0)) - Q(w(1))$ can be decomposed as follows (see Machado and Mata 2005: 450):

$$\begin{aligned} Q(w(0)) - Q(w(1)) &= Q_i(\hat{w}(0)) - Q_i(\hat{w}^*(1)) \\ &+ Q_i(\hat{w}^*(1)) - Q_i(\hat{w}(1)) \\ &+ \mathit{Residual} \end{aligned}$$

The difference due to different endowments at the ith quantile is given by $Q_i(\hat{w}(0)) - Q_i(\hat{w}^*(1)), i = 1, \ldots, 99$ while the difference caused by different coefficients is given by $Q_i(\hat{w}^*(1)) - Q_i(\hat{w}(1)), i = 1, \ldots, 99$. Standard errors for the decomposition are obtained by bootstrapping steps (1) to (5) and the resulting decompositions with 1000 replications.

A critical, but necessary assumption for the identification of the counterfactual wage distribution is that the estimated coefficients in the wage equation for the dependent employed are also valid in the counterfactual case. This implies that either (i) there is no unobserved heterogeneity (e.g., "ability") that may bias the estimation, or (ii) the unobserved heterogeneity affects both groups in dependent employment in the same way so that the eventual bias in the coefficients is the same for both groups. The second case allows for the existence of a specific "entrepreneurial" ability that may be correlated with wages in self-employment and the observables, but assumes that the self-employed do not posses more or less unobserved ability than the dependent employed when engaging in dependent employment.

Note that we cannot relax this assumption by exploiting the panel character of the data and calculating some sort of fixed or random effect regression as no consensus how these should be implemented in a quantile regression framework has emerged yet (see Koenker 2005, pp. 276-281 for an overview on the progress made so far). Similar problems are faced when trying to implement some sort of sample selection model. First, classical parametric Heckman-selection models are not valid in the context of quantile regression (see Buchinsky 1998 who also proposes a semi-parametric alternative). Second, reliable

identification of the selection correction terms in both parametric and semi-parametric settings would hinge on the existence of variables that influence the choice between self- and dependent employment, but not the wage in either occupation. While such variables can be found quickly in the context of dependent employment, the same is not true for self-employment.

While this is quite obvious for variables as wealth, that influences the self-employment decision by relaxing capital constraints but also influences the potential capital stock in self-employment and thus production possibilities, even candidates as prior self-employment experience of close relatives are not without problems. First, this information is missing for a large number of cases. Second, prior self-employment experience in the family may also influence the amount of "entrepreneurial knowledge" available to the respective person, which in turn may also influence earnings.

5 Results

5.1 Regressions results

Consider first the regression results for the self-employed reported in table 4. With the exception of the dummy for no post-school training at the upper deciles of the distribution, all point estimates have the expected signs. However, when it comes to statistical significance, education, except for academic training, does not seem to influence self-employed earnings very much. The earnings advantage associated with academic training varies considerably over the distribution, actually doubling between the 10% and 90% decile.

(Table 4 about here.)

Rather surprisingly, tenure with the current firm – in this case, the duration of self-employment – does not seem to influence earnings. Full-time work and unemployment experience influence earnings quite differently: While the earnings advantage associated with another year of full-time work experience is relatively constant over the earnings distribution, the disadvantage associated with years of unemployment varies from -0.15 at the bottom of the earnings distribution over statistical insignificance at the 75% quantile to -0.1 at the top decile.

Looking at the earnings differences associated with occupations, note that there are no significant differences at the bottom of the distribution. However, differences between several occupations can be noted at higher deciles. From the 25% quantile onward white collar workers (management, office clerks) are paid significantly more than production workers. There is also a significant earnings advantage for those in technical occupations in the middle of the distribution that declines while moving toward the top.

While the preceding discussion was based on informal comparisons of the point estimates along the distribution, equality of coefficients can also be tested formally using the estimated variance-covariance-matrix of the system of quantile regressions. P-values for the null hypothesis of parameter homogeneity between quantiles are shown in table 5. The evidence points toward a homogeneous impact of all variables over the distribution, not rejecting the null hypothesis at any conventional level.

(Table 5 about here.)

Next, turn to the results for the dependent employed shown in table 6. First note that almost all coefficients have the expected signs and are significant at the 5%-level. The only exception is the dummy for having received no post-school training that is not significantly different from the base category of having completed vocational training at any quantile. Having received higher secondary schooling has a relatively constant, significantly positive impact over the distribution yielding an earnings advantage in log earnings that varies between 0.14 and 0.17. The impact of academic trainings doubles from 0.1 at the 10% decile to 0.21 at the 90% decile.

(Table 6 about here.)

For the dependent employed tenure is a significant predictor of earnings. Its impact declines over the distribution with roughly the same influence at the mean and the median. Full-time work and unemployment experience have the expected influence, but develop differently over the distribution. While the earnings advantage associated with a further year of employment experience rises over the distribution, the influence of unemployment declines while moving to the top of the distribution. Note further that the decline in earnings associated with unemployment experience is larger in magnitude than the gains associated with work experience. Finally, all squared terms are significant at each quantile implying a decreasing effect of the respective variable at each quantile.

Turning to occupations, one notes that there are no earnings differences between production workers and salesmen. Those in technical occupations and white collar workers earn more at each quantile, while "other services" is associated with an earnings disadvantage from the 25% quantile onward.

Table 7 show the results of the tests for parameter homogeneity across quantiles. Contrary to our findings for the self-employed, the null hypothesis of parameter homogeneity is rejected jointly for academic training, full-time work experience and tenure and between some quantiles for higher secondary schooling, unemployment experience and the squared terms for unemployment experience and tenure. The impact of the squared term for unemployment experience as well as the impact of no post-school training does not vary over the distribution.

(Table 7 about here.)

Finally, comparing the results for the self- and dependent employed yields several interesting differences: First, the self-employed seem to profit relatively less from formal education, with the exception of academic training. Second, unemployment experience is associated with a higher earnings penalty for the self-employed. This difference declines over the distribution and turns between the 75% and 90% decile. Finally, there are some differences between occupations, most notably different signs associated with the categorie "other services". This is most likely due to the aggregation of several distinct occupations into this category, that hides underlying differences in the occupational structure.

5.2 Decomposition results

Turning to the decomposition results, consider first the differences between the marginal earnings of the dependent employed and the counterfactual earnings of the self-employed, both shown in the top panel of figure 3. A comparison of these distributions yields an answer to the question if earnings differences can be explained by the selection of the very able and vary unable into self-employment. Remember that both distributions have been calculated using the same coefficients so differences between them are caused by differences in observed endowments. If only the very able and the very unable selected into self-employment, we would expect the counterfactual earnings distribution of the self-employed to lie below the marginal earnings distribution of the dependent employed at lower quantiles and to lie above it at the higher quantiles.

(Figure 3 about here.)

Note first that both distributions look almost identical with regard to overall shape. Now consider the difference between these distributions shown in the lower panel of figure 3. This is calculated at each quantile as $Q_i(\hat{w}(0)) - Q_i(\hat{w}^*(1)), i = 1, \ldots, 99$, where $Q_i(\hat{w}(0))$ is the ith quantile of the dependent employed's marginal wage distribution and $Q_i(\hat{w}^*(1))$ is the corresponding quantile of the counterfactual distribution for the self-employed. Note that there is almost no difference between these distributions, which is a clear sign that there are no observable endowment differences between the self- and dependent employed anywhere on the distribution.

Next consider the differences between the marginal earnings distribution for the self-employed and the counterfactual distribution shown in figure 4. These distributions have been calculated using the same endowments so differences are due to differences in coefficients. A comparison of these distributions, subject to the acceptance of the identifying assumption outlined in section 4, yields an answer to the question if and for whom self-employment "pays" financially.

(Figure 4 about here.)

Consider first the two earnings distributions in the top panel of figure 4. While both distributions look similar at higher quantiles, a clear difference can be seen below the 20%-quantile where the counterfactual distribution clearly lies above the marginal wage distribution. This is emphasized further when looking at the difference between the distributions in the bottom panel of figure 4. As this difference is calculated as $Q_i(\hat{w}^*(1)) - Q_i(\hat{w}(1)), i = 1, \ldots, 99$, where $Q_i(\hat{w}(1))$ is the ith quantile of the self-employed's marginal wage distribution and $Q_i(\hat{w}^*(1))$ is the corresponding quantile of the counterfactual distribution, a positive difference indicates that the now self-employed could earn more when engaging in dependent employment. This is the case for the self-employed positioned below the 40%-quantile of their earnings distribution. The earnings disadvantage in self-employment is especially large at the lower quantiles, being .5 in log earnings at the 10%-quantile (see Table 8) and becoming (almost) Null between the 30 and 50%-quantiles.

Turning to the upper half of the distribution, one notices that the difference does not deviate largely from Null. Since this difference is caused by differences in returns to

observable variables, we may conclude that the huge earnings advantage observed for the self-employed at the top of the earnings distribution is not caused by a better utilization of their endowments, but rather by some factors unobserved in this study.

(Table 8 about here.)

Table 8 summarizes the decomposition results at selected quantiles. Note that, as already apparent from figures 3 and 4, most of the raw differences in hourly income at the upper and lower tails of the income distribution can be attributed to differences in the coefficients of observable variables. Differences in a number of labor-market relevant characteristics on the other hand seem to play only a minor role in explaining the shape of the earnings differential between the self- and the dependent employed.

6 Conclusion

This paper studied the shape and the determinants of the earnings differential between self- and dependent employed German men. It is a well-established fact that self-employed earnings exhibit a greater variability than those of the dependent employed placing the self-employed to a greater extent in the tails of the population's earnings distribution. Theoretical considerations suggest that this greater variability may be caused by the selection of high and low productive individuals into self-employment. This idea is taken as a starting point for an empirical decomposition analysis.

Using data from the German Socio-Economic Panel, we employ a quantile regression decomposition technique developed by Machado and Mata (2005) to decompose the earnings differential into a part explained by differences in observable endowments and a part explainable by differences in the coefficients associated with these endowments. Findings from standard earnings regressions by OLS and quantile regressions for the self- and dependent employed respectively indicate that the returns to observable variables are somewhat different for the self- and dependent employed. While this is a common result for mean earnings, our results indicate that it also holds when considering different quantiles of the respective earnings distribution.

Finally, our decomposition results show that there are no large endowment differences in labor-market relevant characteristics that could explain the shape of the observed earnings differential. Furthermore, the huge earnings advantage for the self-employed at the upper end of the earnings distribution cannot be explained by a better utilization of their observable endowments, which may be taken as a hint for the existence of a special "ability" for extremely high-earning self-employed. Finally, for self-employed earning below the 40% quantile our results show that, given their observable characteristics, they could earn substantially more in dependent employment. The fact that they nonetheless choose to remain self-employed may point toward either substantial switching costs, effectively preventing a switch into dependent employment, or toward substantial non-pecuniary benefits in self-employment that compensate for the earnings disadvantage.

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8 Appendix – figures and tables

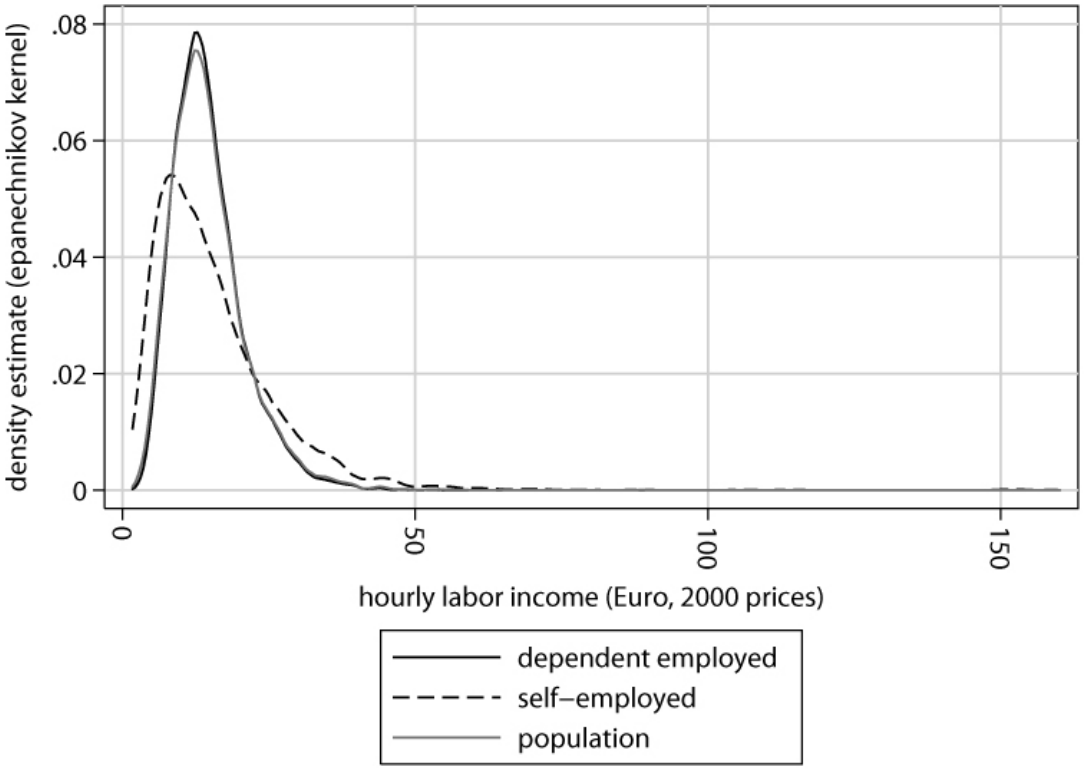


Figure 1: Earnings distributions, self- and dependent employed (Kernel density estimate)

Table 1: Descriptive statistics whole sample

Variable	Mean	Std.dev.	Min.	Max.
Monthly gross labor income (€, in 2000 prices)	2850.74	1324.154	507.85	9917.60
Log monthly gross labor income	7.86	.4327062	6.23	9.20
Weekly working hours	45.25	8.414578	5.00	80.00
Hourly wage (€, in 2000 prices)	14.82	7.192117	1.68	160.11
Log hourly wage	2.60	.4432443	0.52	5.08
Education				
Schooling below Abitur-level (1=yes)	0.67	.470164	0.00	1.00
Higher secondary schooling (1=yes)	0.33	.470164	0.00	1.00
No post-school training (1=yes)	0.07	.259271	0.00	1.00
Vocational training (1=yes)	0.61	.4877414	0.00	1.00
Academic degree (1=yes)	0.24	.4279555	0.00	1.00
Labor market experience				
Tenure (years)	10.58	8.736018	0.00	40.00
Tenure (squared)	188.26	264.948	0.00	1600.00
Lifetime unemployment experience (years)	0.34	.9491095	0.00	21.70
Unemployment experience (squared)	1.01	8.273902	0.00	470.89
Lifetime full-time work experience (years)	17.71	8.789146	0.00	40.00
Full-time experience (squared)	390.90	329.2703	0.00	1600.00
Year of observation				
2000	0.19	.3945574	0.00	1.00
2001	0.17	.376851	0.00	1.00
2002	0.17	.3783698	0.00	1.00
2003	0.16	.3659899	0.00	1.00
2004	0.16	.3657182	0.00	1.00
2005	0.14	.3513615	0.00	1.00
Current field of occupation				
Production	0.36	.4787779	0.00	1.00
Technical occupations	0.14	.3442843	0.00	1.00
Salesmen	0.06	.2409328	0.00	1.00
Management, office clerks	0.18	.3870325	0.00	1.00
Other services	0.26	.4394333	0.00	1.00

Table 2: T-tests of mean equality

Variable	dep. employed	self-employed	p-Value
Monthly gross labor income (€, in 2000 prices)	2794.14	3404.15	0.0000
Log monthly gross labor income	7.85	7.96	0.0000
Weekly working hours	44.36	53.97	0.0000
Hourly wage (€, in 2000 prices)	14.73	15.68	0.0006
Log hourly wage	2.60	2.54	0.0000
Education			
Schooling below Abitur-level (1=yes)	0.68	0.55	0.0000
Higher secondary schooling (1=yes)	0.32	0.45	0.0000
No post-school training (1=yes)	0.07	0.07	0.1973
Vocational training (1=yes)	0.62	0.52	0.0000
Academic degree (1=yes)	0.23	0.33	0.0000
Labor market experience			
Tenure (years)	10.78	8.61	0.0000
Lifetime unemployment experience (years)	0.34	0.32	0.4687
Lifetime full-time work experience (years)	17.67	18.15	0.0163
Year of observation			
2000	0.19	0.19	0.4166
2001	0.17	0.16	0.2373
2002	0.17	0.17	0.6774
2003	0.16	0.17	0.4822
2004	0.16	0.17	0.1907
2005	0.14	0.15	0.6543
Current field of occupation			
Production	0.36	0.29	0.0000
Technical occupations	0.14	0.10	0.0000
Salesmen	0.05	0.15	0.0000
Management, office clerks	0.18	0.18	0.4072
Other services	0.26	0.29	0.0050

Table 3: Raw differences in labor income self- vs. dependent employed

Variable	Quantiles								
	10	20	30	40	50	60	70	80	90
Monthly labor income self-employed	1278.74	1754.431	2072.128	2506.333	2870.813	3508.772	4019.139	4835.59	6244.52
Monthly labor income dependent employed	1544.256	1840.65	2077.562	2306.968	2533.849	2804.642	3107.853	3578.155	4401.914
Difference	-265.5161	-86.21863	-5.434082	199.3652	336.9644	704.1299	911.2856	1257.435	1842.606
Monthly log labor income self-employed	7.15363	7.4699	7.636332	7.826576	7.962351	8.163021	8.298823	8.483758	8.73946
Monthly log labor income depedent employed	7.342298	7.517874	7.63895	7.74369	7.837495	7.939031	8.041687	8.182603	8.389794
Difference	-.1886673	-.0479741	-.0026188	.0828867	.124856	.22399	.2571363	.3011551	.3496656
Hourly wage self-employed	5.432421	7.229827	9.039898	10.86484	12.97897	15.29504	18.10807	22.16989	28.878
Hourly wage dependent employed	7.935327	9.659777	11.14447	12.41696	13.6897	15.06472	16.73858	18.90525	22.69545
Difference	-2.502906	-2.429949	-2.104568	-1.552119	-.7107315	.2303209	1.369488	3.264645	6.182558
Hourly log wage self-employed	1.692385	1.978215	2.201648	2.385532	2.56333	2.727529	2.896358	3.098735	3.36308
Hourly log wage dependent employed	2.071325	2.267971	2.410943	2.519063	2.616644	2.712356	2.817716	2.93944	3.122164
Difference	-.3789396	-.2897553	-.209295	-.1335311	-.0533135	.0151732	.0786414	.1592953	.240916

Figure 2: Earnings distributions self- vs. dependent employed

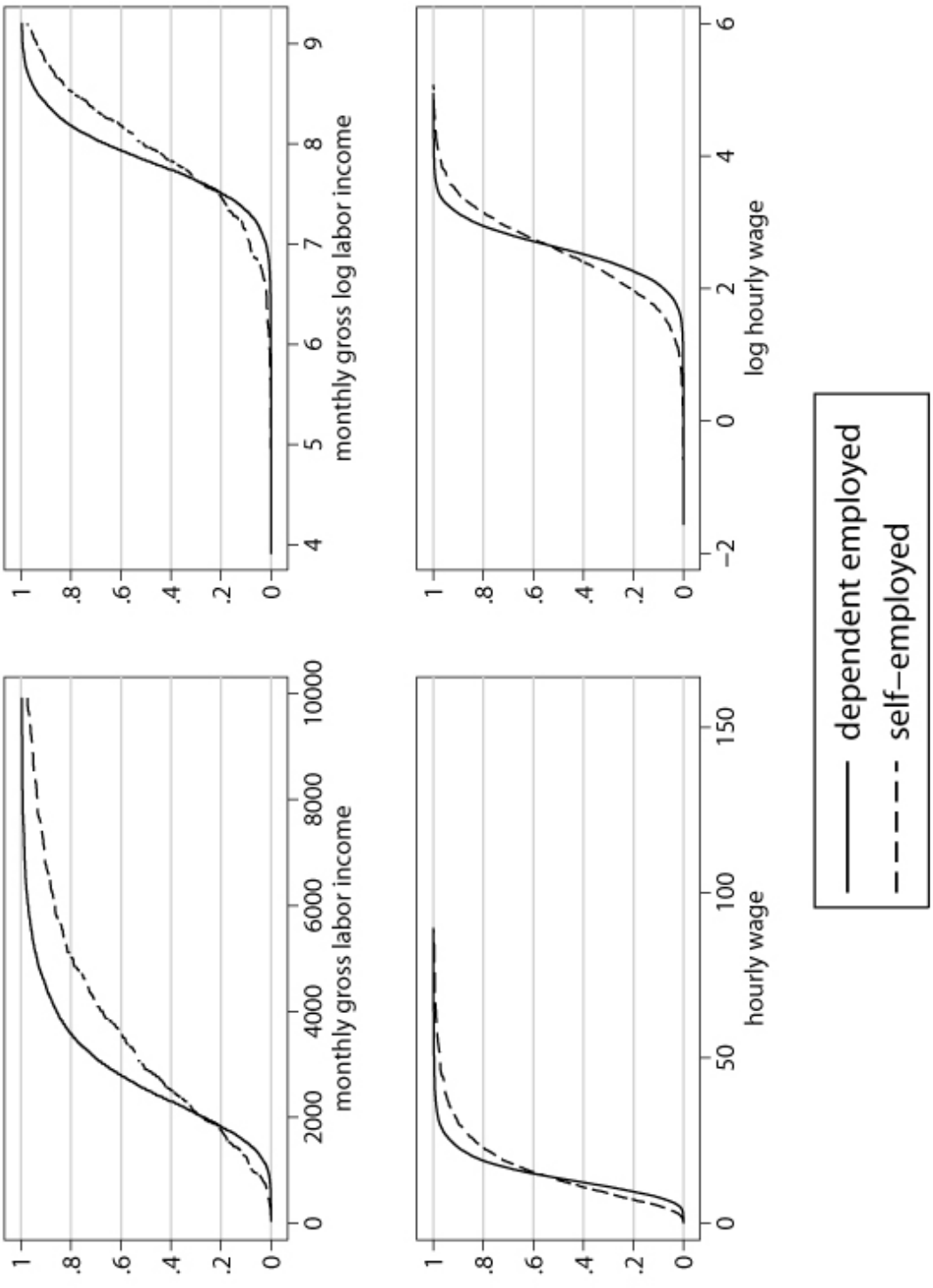


Table 4: Regression results self-employed

Dependent variable: log hourly wage (€, in 2000 prices)	OLS	Quantile regression 10%	25%	50%	75%	90%
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Higher secondary schooling (1=yes)	0.0788	0.0743	0.1041	0.0468	0.0858	0.1052
	(0.308)	(0.353)	(0.200)	(0.427)	(0.161)	(0.248)
No post-school training (1=yes)	0.0171	0.0010	-0.0584	-0.0190	0.0414	0.1053
	(0.868)	(0.991)	(0.571)	(0.794)	(0.639)	(0.439)
Academic degree (1=yes)	0.2410**	0.2428**	0.1443	0.2296***	0.2975***	0.2716**
	(0.005)	(0.007)	(0.097)	(0.000)	(0.000)	(0.005)
Lifetime full-time work experience (years)	0.0328**	0.0241*	0.0371***	0.0306**	0.0378***	0.0262*
	(0.001)	(0.026)	(0.000)	(0.003)	(0.000)	(0.024)
Full-time experience (squared)	-0.0008**	-0.0007*	-0.0010***	-0.0007**	-0.0008**	-0.0005
	(0.004)	(0.019)	(0.001)	(0.004)	(0.002)	(0.068)
Lifetime unemployment experience (years)	-0.0955**	-0.1519**	-0.0717	-0.0894*	-0.0729	-0.1021*
	(0.007)	(0.006)	(0.173)	(0.045)	(0.051)	(0.024)
Unemployment experience (squared)	0.0043*	0.0080	0.0036	0.0034	0.0015	0.0022
	(0.028)	(0.408)	(0.618)	(0.653)	(0.813)	(0.799)
Tenure (years)	0.0021	-0.0022	0.0068	0.0084	-0.0011	-0.0048
	(0.809)	(0.853)	(0.478)	(0.416)	(0.905)	(0.678)
Tenure (squared)	0.0002	0.0004	0.0002	0.0002	0.0003	0.0004
	(0.476)	(0.306)	(0.566)	(0.679)	(0.437)	(0.378)
Technical occupations	0.2285**	0.1426	0.3808***	0.3565***	0.1470*	-0.0246
	(0.007)	(0.185)	(0.000)	(0.000)	(0.024)	(0.776)
Salesmen	0.0362	-0.1031	0.0103	0.0902	0.0294	0.0147
	(0.636)	(0.201)	(0.887)	(0.117)	(0.583)	(0.860)
Management, office clerks	0.2048**	0.0758	0.2046**	0.2582***	0.2133***	0.1331
	(0.002)	(0.377)	(0.001)	(0.000)	(0.000)	(0.098)
Other services	0.1363*	0.0662	0.1356*	0.2071***	0.1442**	0.0812
	(0.034)	(0.249)	(0.027)	(0.000)	(0.005)	(0.306)
2001	-0.0149	0.0852	-0.0572	-0.0384	-0.0413	0.0295
	(0.690)	(0.260)	(0.386)	(0.504)	(0.433)	(0.750)
2002	0.0069	0.0728	-0.0365	0.0078	0.0397	0.0100
	(0.850)	(0.378)	(0.583)	(0.896)	(0.423)	(0.911)
2003	0.0818*	0.0813	0.0042	0.1374*	0.1080*	0.1568
	(0.043)	(0.425)	(0.959)	(0.028)	(0.038)	(0.083)
2004	0.0899*	0.0808	0.0016	0.0720	0.1685**	0.1844*
	(0.031)	(0.336)	(0.984)	(0.172)	(0.002)	(0.023)
2005	0.0360	0.0791	-0.0081	0.0830	0.0339	0.0696
	(0.403)	(0.361)	(0.919)	(0.120)	(0.551)	(0.396)
Constant	1.9823***	1.3698***	1.6025***	1.9509***	2.3016***	2.7597***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	1,909	1,909				
p	0.0000					

OLS standard errors adjusted for clustering at the person level. Quantile regression standard errors bootstrapped with 200 replications. */**/*** denote significance at the 5/1/0.1 % level respectively.

Table 5: Tests of parameter equality across quantiles – self-employed

	Higher secondary schooling	No post-school training	Academic training	Full-time work experience	Full-time exp. squared	Unemployment experience	Unempl. exp. squared	Tenure	Tenure squared
0.1 vs. 0.25	0.7057	0.5934	0.2523	0.2571	0.2750	0.1286	0.4303	0.4264	0.6826
0.1 vs. 0.5	0.7136	0.8481	0.8843	0.5981	0.8333	0.2597	0.4672	0.4022	0.5428
0.1 vs. 0.75	0.9028	0.7261	0.6130	0.2789	0.6892	0.1572	0.4303	0.9320	0.7726
0.1 vs. 0.9	0.7948	0.4864	0.8201	0.8760	0.6483	0.4333	0.5567	0.8757	0.9840
0.25 vs. 0.5	0.3879	0.6752	0.2496	0.5312	0.3347	0.6700	0.9587	0.8730	0.8094
0.25 vs. 0.75	0.8327	0.3898	0.1110	0.9529	0.5458	0.9798	0.7356	0.4362	0.9214
0.25 vs. 0.9	0.9920	0.2884	0.2889	0.4277	0.1578	0.6034	0.8759	0.3691	0.7718
0.5 vs. 0.75	0.5419	0.4519	0.3499	0.4305	0.7801	0.6094	0.7042	0.3109	0.7111
0.5 vs. 0.9	0.5292	0.3261	0.6674	0.7264	0.4612	0.7780	0.8822	0.3180	0.6167
0.75 vs. 0.9	0.8081	0.5647	0.7556	0.2687	0.2651	0.4345	0.9219	0.7186	0.7660
joint test	0.8829	0.8556	0.5453	0.5660	0.5614	0.4806	0.9438	0.7261	0.9701

Table 6: Regression results dependent employed

Dependent variable: log hourly wage (€, in 2000 prices)	OLS	Quantile regression 10%	25%	50%	75%	90%
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Higher secondary schooling (1=yes)	0.1507***	0.1372***	0.1441***	0.1683***	0.1677***	0.1531***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No post-school training (1=yes)	-0.0083	-0.0239	0.0077	-0.0065	-0.0138	-0.0001
	(0.635)	(0.263)	(0.558)	(0.497)	(0.266)	(0.995)
Academic degree (1=yes)	0.1565***	0.1000***	0.1350***	0.1620***	0.2002***	0.2083***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lifetime full-time work experience (years)	0.0204***	0.0131***	0.0151***	0.0183***	0.0227***	0.0249***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Full-time experience (squared)	-0.0005***	-0.0004***	-0.0004***	-0.0004***	-0.0005***	-0.0005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lifetime unemployment experience (years)	-0.0781***	-0.0777***	-0.0788***	-0.0788***	-0.0760***	-0.0584***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Unemployment experience (squared)	0.0051***	0.0055***	0.0050***	0.0050***	0.0048***	0.0026
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.127)
Tenure (years)	0.0197***	0.0288***	0.0245***	0.0190***	0.0150***	0.0141***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tenure (squared)	-0.0003***	-0.0004***	-0.0003***	-0.0003***	-0.0002***	-0.0003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Technical occupations	0.1984***	0.2308***	0.2332***	0.1954***	0.1725***	0.1573***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Salesmen	0.0265	0.0166	0.0115	0.0138	0.0288	0.0644***
	(0.251)	(0.463)	(0.486)	(0.371)	(0.063)	(0.000)
Management, office clerks	0.2004***	0.2385***	0.1851***	0.1535***	0.1811***	0.2046***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Other services	-0.0281*	-0.0093	-0.0215*	-0.0501***	-0.0455***	-0.0309**
	(0.020)	(0.510)	(0.027)	(0.000)	(0.000)	(0.005)
2001	0.0118*	0.0140	0.0094	0.0157	0.0097	0.0144
	(0.020)	(0.345)	(0.422)	(0.061)	(0.265)	(0.315)
2002	0.0218***	0.0228	0.0097	0.0185	0.0326***	0.0458**
	(0.000)	(0.133)	(0.426)	(0.062)	(0.000)	(0.001)
2003	0.0524***	0.0415**	0.0307*	0.0515***	0.0668***	0.0889***
	(0.000)	(0.008)	(0.020)	(0.000)	(0.000)	(0.000)
2004	0.0414***	0.0373*	0.0313**	0.0384***	0.0452***	0.0669***
	(0.000)	(0.025)	(0.007)	(0.000)	(0.000)	(0.000)
2005	0.0332***	0.0331*	0.0183	0.0406***	0.0367***	0.0550***
	(0.000)	(0.045)	(0.142)	(0.000)	(0.000)	(0.000)
Constant	2.1423***	1.7241***	1.9631***	2.1865***	2.3549***	2.4955***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	18,665	18,665				
p	0.0000					

OLS standard errors adjusted for clustering at the person level. Quantile regression standard errors bootstrapped with 200 replications. */**/*** denote significance at the 5/1/0.1 % level respectively.

Table 7: Tests of parameter equality across quantiles – dependent employed

	Higher secondary schooling	No post-school training	Academic training	Full-time work experience	Full-time exp. squared	Unemployment experience	Unempl. exp. squared	Tenure	Tenure squared
0.1 vs. 0.25	0.6409	0.0837	0.0277	0.3152	0.4462	0.9029	0.6047	0.0260	0.2451
0.1 vs. 0.5	0.0885	0.3949	0.0032	0.0341	0.4841	0.9078	0.6498	0.0000	0.0783
0.1 vs. 0.75	0.1437	0.6608	0.0000	0.0001	0.0531	0.8723	0.5097	0.0000	0.0127
0.1 vs. 0.9	0.4668	0.3194	0.0000	0.0000	0.0554	0.1267	0.1087	0.0000	0.0493
0.25 vs. 0.5	0.0411	0.2158	0.0599	0.0579	0.8745	0.9989	0.9631	0.0000	0.2290
0.25 vs. 0.75	0.1139	0.1719	0.0001	0.0001	0.0865	0.7483	0.8322	0.0000	0.0395
0.25 vs. 0.9	0.5917	0.6507	0.0001	0.0001	0.1069	0.0788	0.1895	0.0000	0.1831
0.5 vs. 0.75	0.9526	0.5130	0.0007	0.0019	0.0428	0.6752	0.7516	0.0005	0.1424
0.5 vs. 0.9	0.2761	0.6674	0.0016	0.0009	0.0699	0.0586	0.1669	0.0043	0.5222
0.75 vs. 0.9	0.2009	0.3143	0.5363	0.1596	0.6256	0.0511	0.1449	0.5215	0.6352
joint test	0.2206	0.2779	0.0000	0.0001	0.1518	0.3749	0.6008	0.0000	0.1381

FIGURE 3: COMPARISON OF DEPENDENT EMPLOYED'S MARGINAL EARNINGS DISTRIBUTION AND SELF-EMPLOYED'S COUNTERFACTUAL EARNINGS DISTRIBUTION

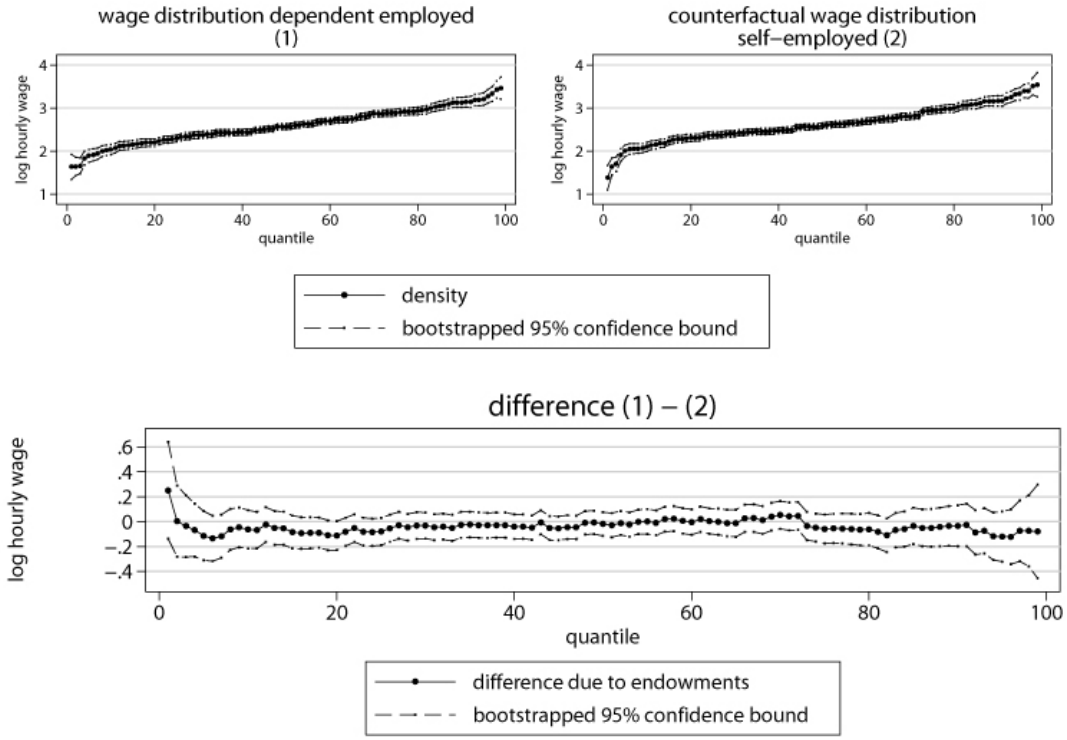
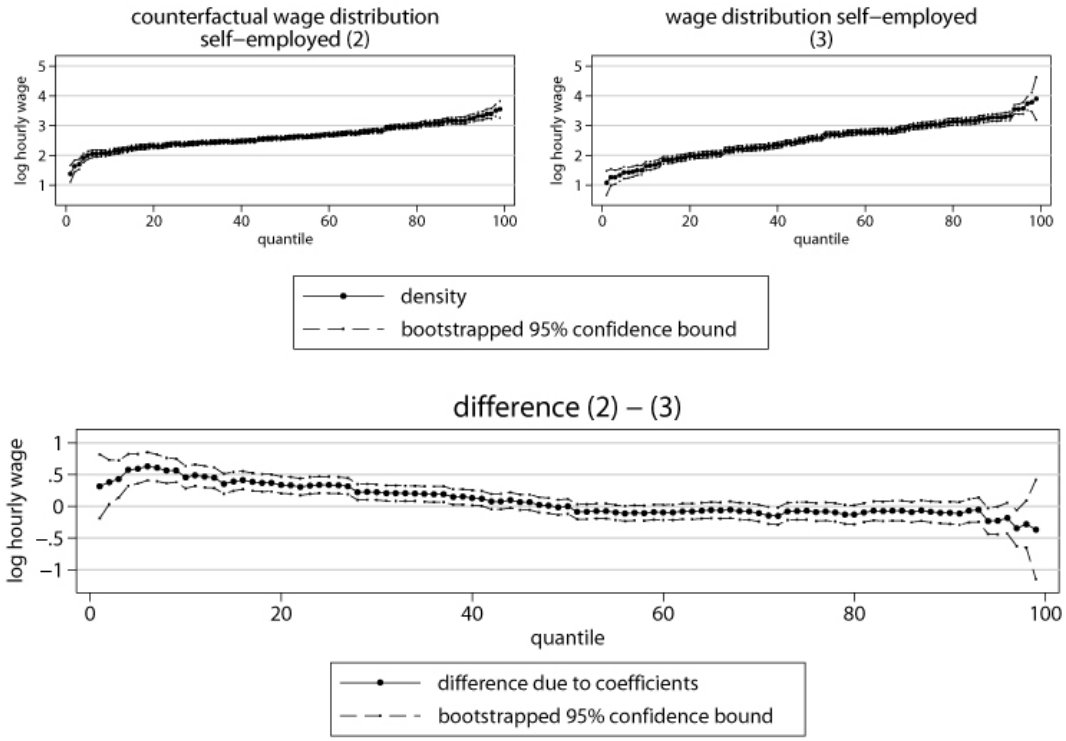


TABLE 8: DIFFERENCES BETWEEN EARNINGS DISTRIBUTIONS

	10%	25%	50%	75%	90%
Raw difference: $w(0) - w(1)$	.3789396	.2623653	.0533135	-.103961	-.240916
Explained by endowments: $\hat{w}(0) - \hat{w}^*(1)$	-.0627475	-.0807531	-.0199599	-.0587792	-.033376
Std. dev.	.0785903	.0558577	.0486175	.0590028	.0840075
Explained by coefficients: $\hat{w}^*(1) - \hat{w}(1)$	.45859	.3364048	-.0022004	-.0719886	-.1033049
Std. dev.	.0895947	.0671135	.059767	.0708587	.0891242
Residual	-.0169029	.0067136	.0754738	.0268068	-.1042352

All differences in log hourly earnings in 2000 prices

FIGURE 4: COMPARISON OF MARGINAL AND COUNTERFACTUAL SELF-EMPLOYED'S EARNINGS DISTRIBUTION



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